

# **Pacific Region Crew Alertness Quality Action Team Final Report**



**AMERICAN WATERWAYS OPERATORS**

April 26, 2002

## **Executive Summary**

During the summer of 2000 a tugboat pushing an empty gravel barge struck a fixed span of the highway 520 bridge in the Seattle Metropolitan area. A United States Coast Guard (USCG) investigation revealed that fatigue, number of work-hours, and conflicts between company policy and work-hour regulations may have been contributing factors causing the accident.

In response the Pacific Region Quality Steering Committee chartered a Quality Action Team (QAT). The QAT was directed to collect best-practices for both enhancing crew alertness and complying with existing federal regulations and company policies governing work-hours. This task was to include an examination of rules, regulations and policies as well as specific tug operations as they relate to crew alertness in the towing industry.

In addition the QAT was asked to make recommendations, based upon their best judgment and input from Pacific Region towing companies, as to what best practices might be employed to promote crew alertness and compliance with the 12-hour rule.

Quality Action Team members were selected for their knowledge and experience. A total of 10 representatives made up the QAT- five (5) from Pacific Region towing companies, two (2) from the USCG, two (2) from the Washington State Department of Ecology (DOE) and one (1) from the Pacific Region American Waterways Operators (AWO).

The Quality Action Team collected best practices and identified factors impacting crew alertness through a qualitative survey administered to a representative cross-section of West Coast towing companies.

### ***Recommendations:***

#### ***1. Crew Endurance Management Systems (CEMS)***

The QAT recommended that the American Waterways Operators in conjunction with the USCG develop a Crew Endurance Management System applicable to the West Coast towing industry.

#### ***2. Safety Management System Crew Alertness Component***

The QAT recommended that the American Waterways Operators (AWO) incorporate the principles of the developed Crew Endurance Management System into the required elements of the Responsible Carrier Program.

#### ***3. 12-hour Law Compliance Recommendations***

The QAT organized the collected best-practices into a guideline to assist towing vessel operators to identify and address specific towing operations that may be at risk of violating the 12-hour rule.

#### ***4. Crew Alertness Training***

The QAT recommended that towing companies immediately incorporate a module regarding crew endurance factors into their crew training programs. The training should clearly describe a company's policies and procedures for reporting and addressing reduced crew alertness when it is identified.

#### ***5. Implementation***

The Quality Action Team recommends distribution of this report to the West Coast towing industry and that the recommended best practices, or equivalent, be implemented as an added component to the current Responsible Carrier Program (RCP) audit procedure. The implementation of these best practices among non-American Waterways Operators companies will best be pursued by the Coast Guard through contacts in Harbor Safety Committees and other industry forums.

# Table of Contents

1.	Quality Action Team History.....	1
1.1	Introduction.....	1
1.2	Purpose.....	1
1.3	Deliverables .....	2
1.4	Team Members .....	2
1.5	Proceedings.....	3
1.6	Assigned Project .....	3
1.7	Member Roles.....	4
1.8	Identification of Focus Areas.....	5
2.	Regulatory Overview .....	7
2.1	U.S. Regulations & Policies.....	7
2.2	International Standards .....	7
2.3	Master’s Liability.....	7
2.4	Regulatory Conflicts .....	8
3.	Research Review: Environmental & Physiological Alertness Factors .....	8
3.1	Factors.....	8
3.2	Ergonomics .....	11
3.3	Conclusion: Review of Literature.....	12
4.	Pacific Region Survey.....	13
4.1	Query Format.....	13
4.2	Query Trial & Final Revision .....	13
4.3	Survey Process.....	13
4.4	Company Selection .....	14
4.5	Response .....	14
4.6	Survey Results .....	15
4.7	Best-practices.....	28
5.	Recommendations.....	32
5.1	Overview.....	32
5.2	Long Term Recommendations.....	32
5.3	Interim Recommendations .....	33
	Appendix A.....	A1
	Appendix B.....	B1
	Appendix C.....	C1

# **Quality Action Team History**

# 1. Quality Action Team History

## 1.1 Introduction

During the summer of 2000 a tugboat pushing an empty gravel barge struck a fixed span of the highway 520 bridge in the Seattle Metropolitan area. A United States Coast Guard (USCG) investigation revealed that fatigue, number of work-hours, and conflicts between company policy and work-hour regulations may have been contributing factors causing the accident. This high profile allision received a great deal of press coverage and had a significant impact on the public at large, crippling a major commuter arterial for close to a month, causing extensive traffic delays.

In this atmosphere of heightened public awareness the press and the general public raised several legitimate questions:

- *To what extent is crew alertness compromised in towing vessel operations?*
- *Who sets alertness and work-hour operating parameters for towing vessels?*
- *What are the regulatory and enforcement roles of the USCG and/or other federal or state agencies?*
- *How has the towing industry addressed the issue of crew alertness?*
- *How did the current matrix of work-hour rules and company policies and procedures fail in this particular incident?*
- *Could this failure be repeated on other towing vessels?*
- *Who is accountable for ensuring that there won't be a recurrence of a towing vessel casualty related to crew alertness?*

This incident placed a great deal of pressure on both the USCG and the towing industry to address these concerns. In response the American Waterways Operators (AWO) and USCG Pacific Region Quality Steering Committee (QSC) appointed a Quality Action Team (QAT) to identify best-practices for the management of crew alertness.

## 1.2 Purpose

The QAT was chartered to identify best-practices for the management of crew alertness. Its objective was to include an examination of all rules, regulations and policies as well as specific tug operations as they relate to crew alertness in the towing industry.

## QAT History

In addition to identifying current practices, the QAT was asked to make recommendations as to what best-practices might be employed to promote crew alertness and compliance with the 12-hour rule. These recommendations were to be based upon their best judgment and input from Pacific Region towing companies.

### **1.3 Deliverables**

The QAT was assigned the following deliverables regarding crew alertness:

- 1) An Executive Summary giving an overview of QAT research and findings.
- 2) A review and listing of all existing company rules, policy, and union contract language impacting crew alertness.
- 3) Identification of conflicts, either real or perceived, in existing laws, regulations and policy of the USCG.
- 4) A summary of all obstacles to the maintenance of crew alertness.
- 5) A summary of best-practices currently employed to promote crew alertness and crew compliance with existing work-hour regulations including:
  - Specific recommendations for Pacific Region towing companies to avoid conflicts between company policies and practices and existing work-hour regulations.
  - Specific recommendations for Pacific Region towing companies to monitor compliance with existing work-hour regulations.
  - Specific recommendations for Pacific Region towing companies in the utilization of best-practices to promote crew alertness and compliance with work-hour regulations.
- 6) A recommended educational program or process for heightening awareness of the overriding importance of promoting crew alertness and compliance with work-hour regulations. This program should target both vessel crews and company management.

### **1.4 Team Members**

Quality Action Team members were selected for their knowledge and experience. The QAT consisted of:

- (5) Pacific Region towing company representatives.
- (1) USCG District 13 representative.
- (1) USCG District 11 representative.
- (2) Washington State Department of Ecology (DOE) representatives.
- (1) Pacific Region American Waterways Operators (AWO) representative.

### **1.5 Proceedings**

Quality Action Team members from Industry and Regulatory Agencies brought together a diverse and often times conflicting set of interests. However, all members came with a common interest in enhancing crew alertness, complying with regulatory work-hour rules, and preventing accidents.

Team Members identified several conflicts of interest that had the potential to create an adversarial atmosphere. As a result of extensive discussion members reached consensual agreement to focus on their common interests in meeting the QAT deliverables. Members decided to put aside, or minimize company-specific or agency-specific agendas that would hinder an open exchange of information.

In order to facilitate the process of information gathering the QAT agreed that:

- 1) Towing Company representatives would use their experience and personal contacts in the towing industry to solicit participation from a representative cross section of Pacific Region Towing Companies.*
- 2) USCG Representatives would focus on fact finding, rather than enforcement, thereby creating a “no-fault” exchange of information.*
- 3) The Washington State Department of Ecology representatives would participate as a resource and interested party.*

### **1.6 Assigned Project**

The QAT was asked to develop and implement a process to collect input from the greatest possible number of Pacific Region towing companies.

The two (2) goals of this collection process were to be:

- 1) Identification of problems and difficulties in complying with existing work-hour regulations.*
- 2) Identification of current industry practices that have proved effective in promoting crew alertness and compliance with work-hour regulations.*

## QAT History

Additionally, QAT members agreed to utilize their expertise and resources in developing a process that would:

- 1) Facilitate Industry participation.*
- 2) Promote open communication between West Coast Towing Companies and the QAT.*
- 3) Produce a qualitative assessment of West Coast current practice in addressing Crew Alertness/Work-Hour compliance issues.*
- 4) Protect Towing Company Identities.*
- 5) Collect Best-practices.*
- 6) Remain within the scope of the QAT's resources.*

### **1.7 Member Roles**

#### **USCG**

- 1) Identify existing U.S. work-hour regulations/policies that apply to towing vessels.*
- 2) Identify existing Standards of Training, Certification and Watchkeeping (STCW) work-hour regulations that apply to towing vessels.*
- 3) Identify existing U.S. rules/policies that define the responsibilities and liabilities of licensed personnel.*
- 4) Define terms used in those regulations/policies.*
- 5) Summarize any conflicts, either real or perceived, in the above regulations/policies that impact crew alertness or work-hour rule compliance.*

#### **Washington State Department of Ecology**

- 1) Present to the QAT an overview of environmental and biologic factors affecting crew alertness.*
- 2) Confer with the USCG and update QAT members as to the status of the ongoing Washington State Ferry study.*
- 3) Compile a list of Alternative Watch Schedules.*



### **Towing Company Representatives**

- 1) *Compile a list of representative West Coast Towing Companies.*
- 2) *Develop a query process that identifies:*
  - *Problems and difficulties in complying with existing work-hour regulations.*
  - *Best-practices that have proved effective in promoting crew alertness and compliance with work-hour regulations.*

## **1.8 Identification of Focus Areas**

The QAT identified four (4) categories of factors affecting crew alertness and work-hour rule compliance.

### **Category 1- Federal Work-hour/Watchstanding Regulations**

- *Federal Work-Hour Regulations (12-Hour Rule)*
- *Federal Policy Letters & Clarifications*
- *STCW Watchstanding Hours/Work Rules*
- *Masters Legal Responsibilities*
- *Mate's Legal Responsibilities*
- *OPA 90's work-hour rules*

### **Category 2- Environmental & Biologic Factors**

The QAT decided it was not within its resources or scope to conduct extensive research into environmental and physiological factors specifically related to towing vessel operations. However there are several ongoing research projects as well as accident investigations that are taking a detailed look at environmental and biologic factors.

These studies are focused on blue-water merchant ships, inland ferry and brown-water (inland) towing operations. It was agreed that a general informational overview of this research would enhance the QAT's work.

**Category 3-      Company Policies/Procedures**

- *Master's Responsibilities*
- *Mate's Responsibilities*
- *Manning Levels*
- *Labor Agreements/ Contracts*

**Category 4-      Vessel Operations**

The QAT identified operating parameters and/or vessel activities that, in practice, may present alertness/work-hour rule compliance conflicts.

**Ocean/Coastal Towing**

- *Operations "at sea"*
- *Port Entries and Departures*
- *Bar Crossings*
- *Transits through High Traffic Areas*
- *Cargo Operations in Port*

**Ship Assist/Escorts**

- *Day Boat Operations*
- *24-Hour (Continuous Operation) Ship Assist/Escort Operations*

**Harbor/Inland Towing**

- *Day Boat Operations*
- *24-Hour (Continuous Operation) Harbor Operations*
- *River Towing*
- *Bunkering Operations*
- *Marine Construction Operations*

# **Literature Review: Regulations & Research**

## **2. Regulatory Overview**

### **2.1 U.S. Regulations & Policies**

The existing work-hour statutes and regulations can be confusing despite the effort to consolidate them 20 years ago. Appendix A contains a compilation of the U.S. laws and regulations pertaining to work-hours and manning of towing industry vessels. In Appendix B is a copy of Commandant's (G-MOC) Policy Letter 4-00 Rev "Watchkeeping and Work-Hour Limitations on Towing Vessels, Offshore Supply Vessels (OSV) & Crew Boats Utilizing a Two Watch System." Within this letter Commandant summarized and clarified the assorted laws, regulations and policies pertaining to the work-hour limitations and watchkeeping requirements of the subject industry vessels. The letter also defines many terms that have up to this point been undefined.

### **2.2 International Standards**

The recently adopted International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1995 (STCW) contains additional guidance on crew rest. For voyages that fall under the STCW convention the crew rest provisions of the STCW Code require that mariners be afforded at least 10 hours of rest every 24 hours with one block at least 6 hours long. The rest periods may be temporarily reduced to one 6 hour period provided that the reduction lasts no longer than two days and that the mariner receives not less than 70 hours of rest in each 7 day period.

Additional guidance on this subject is available in Navigation and Vessel Inspection Circular (NVIC) 7-00, "Clarification of the Application of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978 as Amended, to Vessels Less Than 200 Gross Register Tons (GRT).

### **2.3 Master's Liability**

During the course of the QAT discussions the question of the vessel master's liability for any casualties that might occur while the mate was on watch was raised. Examination of the Commandant's Decisions on Appeal revealed a consistent application of the doctrine of the responsibility of the individual in charge of the direction and control of the vessel.

In one particular case (CDOA #2373, Appendix C) the mate, who had run the vessel aground while on watch, contended that since the voyage in question did not involve the operation of the vessel for a period of more than 12 hours in any 24 hour period, only one licensed operator was required and that licensed operator was the master because she was listed as master on the Certificate of Registry. Appellant argued that even though he was at the wheel of the vessel, and was otherwise in control of the operation of the vessel for a substantial part of the time prior to grounding, he was not acting under the authority of his license.

The decision concluded that an "operator" license is not a management license but a control license, and an "operator" is subject to charges for professional activities peculiar to his licensed status solely for the period during which he is directing and controlling the vessel. The relevant inquiry, then, is who was in control of the vessel at the time in question, not who was listed as master. At the time of the grounding the mate was in control of the vessel while the master was below, as she had been for some period of time. Since the mate was at the wheel and in full control of the vessel's navigation for a substantial period of time before and at the time of the grounding, the Administrative Law Judge found that it was the mate who was responsible, and this decision was upheld on appeal. A copy of the decision is enclosed as Appendix C.

### **2.4 Regulatory Conflicts**

One of the objectives for the QAT was to identify any regulatory conflicts which had an impact on crew alertness or 12-hour rule compliance. The only conflict identified, is that owing to the necessities of conducting a proper relief, it is impossible for mariners on a two-watch system to work only 12 hours each. The Commandant (G-MOC) Policy Letter 4-00, Revision 1 mentioned in Section 2.1 addresses this by recognizing this conflict and permitting a minimal amount of activities such as watch reliefs and safety drills which are necessary for the continued safe operation of the vessel.

## **3. Research Review: Environmental & Physiological Alertness Factors**

### **3.1 Factors**

Tug operators are subject to a variety of environmental and physiological factors that have the potential to reduce alertness and performance. Recent work done by the U.S. Coast Guard's Crew Endurance Management<sup>1</sup> initiative divides factors affecting crew endurance into three categories:

- *Environmental factor - Effects of motion and temperature on the body.*
- *Physiological factor - Effects of sleep loss and shift work on the body and performance.*
- *Psychological factor - Effects of stress and working conditions on performance.*

The U.S. Coast Guard's publication, *Management of Endurance Risk Factors: A Guide for Deep Draft Vessels*, contains information on the factors that fit into these.

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<sup>1</sup> *Management of Endurance Risk Factors: A Guide for Deep Draft Vessels*. USCG. 2001

## Literature Review

*Management of Endurance Risk Factors: A Guide for Deep Draft Vessels* outlines several "crew endurance risk factors" that carry special relevance for the towing industry. They include:

- 1) *Insufficient daily sleep duration (less than 7-8 hours of uninterrupted sleep).*
- 2) *Poor sleep quality (awakenings during the night due to work related disruptions or noisy environment).*
- 3) *Sleep fragmentation (daily rest periods are numerous but never allow 7-8 hours of uninterrupted sleep).*
- 4) *Sustained work-hours with no breaks (optimal to break 15 minutes per hour)*
- 5) *High workload (high physical and/or mental effort requirements)*
- 6) *High stress (caused by extreme temperatures, high sustained physical or mental workload, rotating work-schedules, and/or authoritarian leadership style).*
- 7) *Harsh operating environment (noise, vibration).*
- 8) *Excessive exposure to extreme environmental temperatures (cold and heat stress).*

## Literature Review

A more comprehensive list of factors were outlined in Dr. Martin Moore-Ede's case study of the collision between the harbor assist tug NIEL McALLISTER and the cruise ship FESTIVALE in 1988 that resulted in the sinking of the tug.<sup>2</sup>

- 1) *Hours of consecutive duty at time of accident.*
- 2) *Hours of duty in preceding week.*
- 3) *Irregularity of duty schedule.*
- 4) *Time of day relative to physiological clock.*
- 5) *Predawn effect.*
- 6) *Hours since last consolidated sleep.*
- 7) *Duration of last consolidated sleep.*
- 8) *Cumulative sleep deprivation over past week.*
- 9) *Timing and duration to naps since last consolidated sleep.*
- 10) *Fear/awareness of danger.*
- 11) *Monotony/stimulation of job.*
- 12) *Monotony/stimulation of social/physical environment.*
- 13) *Prior physical and mental workload.*
- 14) *Environmental temperature.*
- 15) *Environmental lighting.*
- 16) *Environmental sound.*
- 17) *Environmental aroma.*
- 18) *Ingested chemical stimulants/depressants.*
- 19) *Physiological circadian/sleep-wake type.*

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<sup>2</sup> The Twenty-Four Hour Society: Understanding Human Limits in a World That Never Stops. Martin Moore-Ede, M.D., Ph.D. Addison-Wesley Publishing Company. 1993. Pp 140-145.

Dr. Moore-Ede, a specialist in the area of circadian physiology, then outlined the behaviors that may result in an accident as a result of reduced alertness brought on by one or more of these factors. He listed the following behaviors.

- 1) *Loss of attention in a dangerous situation.*
- 2) *Fixed focus on minor problem, when there is a risk of a major one.*
- 3) *Failure to anticipate danger.*
- 4) *Divided attention.*
- 5) *Automatic behavior syndrome.*
- 6) *Micro-sleeps in safety-critical situations.*
- 7) *Failure to appreciate gravity of problem.*
- 8) *Failure to observe warning signs.*
- 9) *Impaired logical reasoning.*
- 10) *Inappropriate corrective actions.*

### **3.2 Ergonomics**

A specific factor affecting crew alertness that towing companies should consider is ergonomics. Data reviewed by the U.S. Coast Guard in its 1995 Prevention Through People QAT report indicated that "Shipboard Environment" was cited as a problem between 11 and 21 percent of the time in human factors studies and National Transportation Safety Board (NTSB) casualty reports dealing with towboats and tug/barge pairings.<sup>3</sup> Ergonomic considerations affect the immediate work (and sleep) environment for the towboat operator, impact the energy consumed by the tasks performed (physical fatigue), and impact the amount of non-appropriate stress induced in the operator as the task is performed (mental fatigue). Towing companies can improve ergonomic conditions when towboats are designed and built or during major shipyard periods. Guidance concerning ergonomic standards for maritime applications is in publications by the American Society for Testing and Materials (ASTM) and should be incorporated when plans for towboats are developed.

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<sup>3</sup> *Prevention Through People: Quality Action Team Report.* Appendix C. U.S. Coast Guard. July 15, 1995.



### 3.3 Conclusion: Review of Literature

Data was jointly developed in 1996 by Battelle and the U. S. Coast Guard Research and Development Center.<sup>4</sup> While the data collected was from tankers and freighters, the results are instructive for the towing industry as well. Significant findings were:

- 1) *Critical levels of fatigue occur between 8 and 21 percent of the time, driven primarily by personnel on the 4-on/8-off schedule. Recovery sleep periods are often insufficient.*
- 2) *Mariners sleep an average of 6.6 hours per 24-hour period while on shipboard duty - this is 1.3 hours less than average sleep duration at home. Sleep debt is known to be cumulative and reduce performance.*
- 3) *Watchstanders generally obtain less total sleep (6.6 hours) than other shipboard personnel, and the rest period is of lower quality due to sleep fragmentation and physiologically inappropriate sleep times.*
- 4) *Port activities significantly alter the timing of sleep. Frequent changes in sleep timing are known to reduce alertness and performance.*

The problems identified within these conclusions, derived from data on marine personnel on a 4-on/8-off watch schedule, are magnified for tug personnel on a 6-on/6-off watch schedule and/or those that engage more frequently in "port activities."

A survey done by the U.S. Coast Guard's Prevention Through People (PTP) Quality Action Team of 201 deep draft vessel operators resulted in a profile of top mariner concerns.<sup>5</sup> The top three concerns have a high probability of negatively impacting crew alertness. These concerns include:

- 1) *Lack of adequate manpower available (sailing short, etc.).*
- 2) *Fatigue (too tired to think straight).*
- 3) *Poor vessel maintenance (degrading of shipboard environment, making some tasks difficult).*

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<sup>4</sup> *Fatigue and Alertness in Merchant Marine Personnel: A Field Study of Work and Sleep Patterns.* Sandquist, Thomas F., Raby, Mireille, Maloney, Alice L., and Carvalhais, Antonio B.. Report No. CG-D-06-97.

<sup>5</sup> *Through People: Quality Action Team Report.* Appendix F. U.S. Coast Guard. July 15, 1995.

# **Pacific Region Towing Survey**

## **4. Pacific Region Survey**

### **4.1 Query Format**

The first Query draft was a simple 5-question interview intended to be administered by a QAT Towing Company representative over the phone. It was determined that direct contact between a QAT Towing Company representative and the company being surveyed would facilitate a more open response and exchange of information.

As the Query development evolved it became clear that a standard question/answer format would have to be followed by each interviewer and that a set of written guidelines would also be required. In order to ensure that the Queries were administered equitably these guidelines became increasingly detailed and evolved into a written survey.

### **4.2 Query Trial & Final Revision**

The Team Leader administered the draft query to one of the selected towing companies as a trial. Initial results were disappointing. The survey questions were too broad and the Query process too ambiguous to draw out detailed, relevant information. Both the process and written survey were again revised and evolved into its current final form.

### **4.3 Survey Process**

- 1) The Pacific Region American Waterways Operator (AWO) representative sent a Letter of Introduction to the selected towing companies. This letter described the QAT purpose, introduced Industry QAT members and encouraged company participation.*
- 2) A QAT Industry member contacted the Company and administered the Survey via fax, email or phone.*
- 3) The QAT Team leader compiled and recorded the raw data.*
- 4) The Survey Data was analyzed utilizing Team Member's in-house resources.*

#### **4.4 Company Selection**

27 American Waterways Operators (AWO) and 25 non-AWO companies were identified. Of these 52 identified companies, 22 were selected to participate in the survey. Company selection was based on criteria ensuring that a representative cross section of West Coast towing companies would participate in the QAT Survey.

- 14 AWO and 8 Non-AWO
- 7 small (fleet size 15 or less)
- 7 medium (fleet size 15 to 24)
- 3 large (fleet size 25+ Vessels)
- 10 union
- 12 non-union
- 12 with Ocean/Near Coastal operations
- 14 with Harbor/Inland operations
- 7 with Ship Assist/Escort operations

#### **4.5 Response**

17 of the 22 companies completed the survey process.

## **4.6 Survey Results**

The American Waterways Operators (AWO) national office and the Washington State Department of Ecology QAT members analyzed the raw survey data and organized it into summary form. Significant summary points are as follows:

### **Ocean/Near Coastal Towing Operations**

#### **Most Frequently Cited Factors**

*The term “Most frequently cited, identifies the most significant factors in each towing operations category. Listed factors have been selected from the pool of responses in the top 3 percentages of frequency. Ranking of factors is in descending order of frequency.*

#### **Operations at Sea:**

##### ***Alertness Issues***

- 1) Heavy weather
- 2) 6-on/6-off watch schedule
- 3) Heavy vessel traffic

##### ***Work-Hour Rule Issues***

- 1) Heavy vessel traffic
- 2) Heavy weather
- 3) 6-on/6-off watch schedule

##### ***Contributing Factors***

- 1) Sleep environment
- 2) Time of day
- 3) Work environment
- 4) Energy consumed by the task
- 5) Masters’ responsibilities

## **Operations Entering or Departing Port:**

### ***Alertness Issues***

- 1) Ability to receive off-watch rest
- 2) 6-on/6-off watch schedule
- 3) Restricted waterway transits
- 4) Heavy vessel traffic

### ***Work-Hour Rule Issues***

- 1) 6-on/6-off watch schedule
- 2) Restricted waterway transits
- 3) Heavy vessel traffic
- 4) Bar crossings
- 5) Ability to receive off-watch rest

### ***Contributing Factors***

- 1) Duration of task
- 2) Master's responsibilities
- 3) Time of day
- 4) Work environment
- 5) Work-hour restrictions

## **Operations While in Port:**

### ***Alertness Issues***

- 1) 6-on/6-off watch schedule
- 2) Ability to receive off-watch rest
- 3) Cargo operations

### ***Work-Hour Rule Issues***

- 1) 6-on/6-off watch schedule
- 2) Cargo operations
- 3) Vessel repairs
- 4) Ability to receive off-watch rest
- 5) Administrative duties

### ***Contributing Factors***

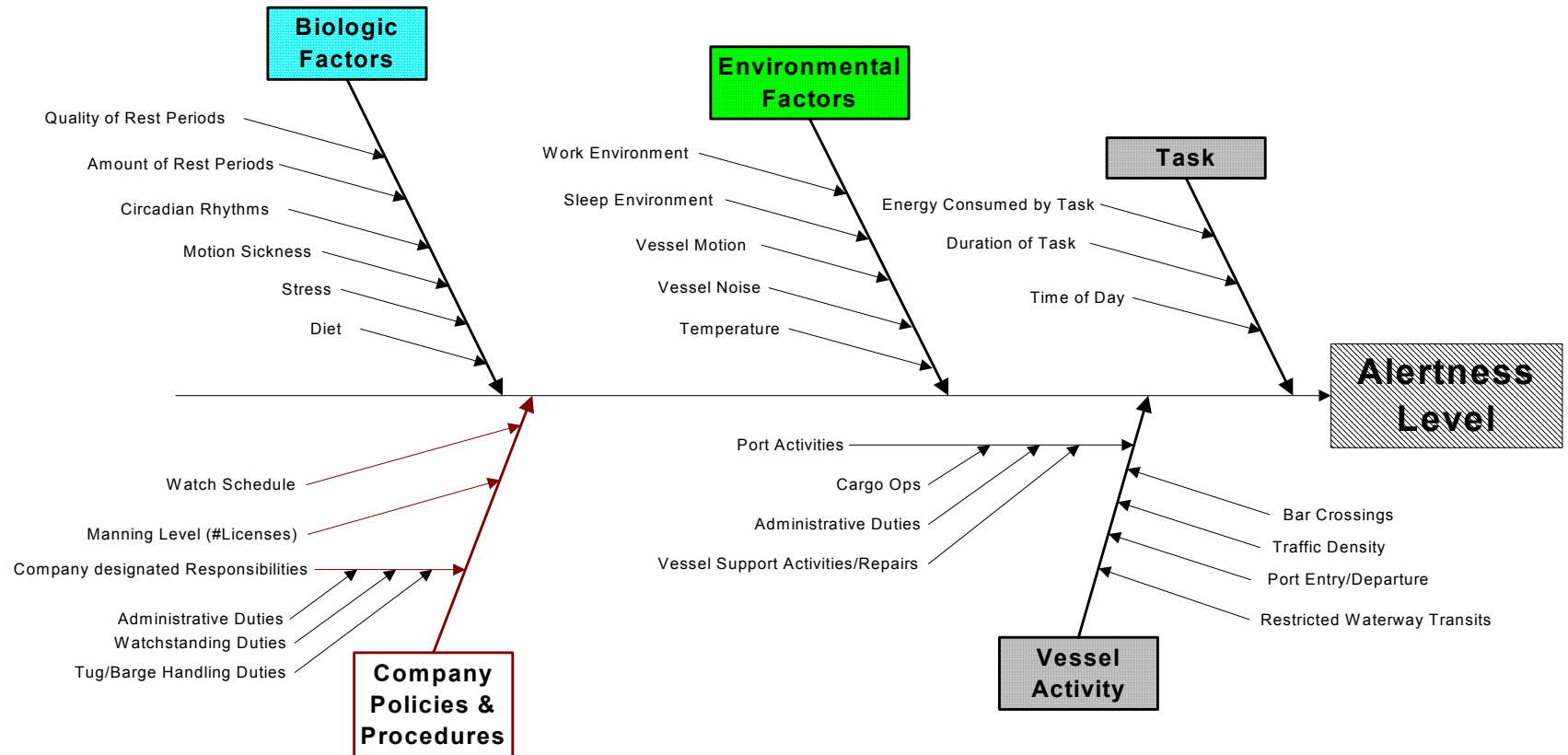
- 1) Duration of task
- 2) Work environment
- 3) Sleep environment
- 4) Energy consumed by the task
- 5) Master's responsibilities

# Towing Survey

## Most Frequently Cited Factors Summary

	"AT SEA"		"IN PORT"		" PORT DEP/ARRV"		
	ALERT	WORK- HOUR	ALERT	WORK- HOUR	ALERT	WORK- HOUR	
<b>Factors</b>							
6 & 6 Watch	•	•	•	•	•	•	
Master's Responsibilities	•	•	•	•	•	•	
Work Environment	•	•	•	•	•	•	
Sleep Environment	•	•	•	•			
Ability to receive off-watch rest			•	•	•	•	
Duration of Task			•	•	•	•	
Energy Consumed by Task	•	•	•	•			
Time of Day	•	•			•	•	
Heavy Traffic	•	•			•	•	
Heavy Weather	•	•					
Cargo Operations			•	•			
Restricted Waterways					•	•	
Work-Hour Restrictions					•	•	
Bar Crossings						•	
Vessel Repairs				•			
Administrative Duties				•			

## OCEAN/COASTAL TOWING SUMMARY OF ALL FACTORS IMPACTING CREW ALERTNESS





## **Harbor/Inland Towing Operations:**

### **24-Hour/Continuous Operations**

#### ***Alertness Issues***

- 1) Ability to receive off-watch rest
- 2) Initial crew fitness for duty
- 3) 6-on/6-off watch schedule
- 4) Job dispatch schedule

#### ***Work-Hour Rule Issues***

- 1) 6-on/6-off watch schedule
- 2) Job dispatch schedule
- 3) Ability to receive off-watch rest
- 4) Travel time required for crew changes
- 5) Heavy vessel traffic
- 6) Restricted waterway transits

#### ***Contributing Factors***

- 1) Sleep environment
- 2) Duration of task
- 3) Work environment
- 4) Masters' responsibilities

## **Day-Boat Operations**

### ***Alertness Issues***

- 1) Initial crew fitness for duty
- 2) Crew member on-call status
- 3) Ability to receive off-watch rest
- 4) Travel time required for crew changes
- 5) Job dispatch schedule

### ***Work-Hour Rule Issues***

- 1) Crew member on-call status
- 2) Initial crew fitness for duty
- 3) Time required for crew changes
- 4) Heavy vessel traffic
- 5) Restricted waterway transits
- 6) Normal watch duties

### ***Contributing Factors***

- 1) Energy consumed by task
- 2) Time of day
- 3) Work environment
- 4) Sleep environment
- 5) Master's responsibilities

## **River Operations**

### ***Alertness Issues***

- 1) 6-on/6-off watch schedule
- 2) Ability to receive off-watch rest
- 3) Normal watch duties
- 4) Making/breaking tows
- 5) Heavy vessel traffic
- 6) Restricted waterway transits

### ***Work-Hour Rule Issues***

- 1) 6-on/6-off watch schedule
- 2) Normal watch duties

### ***Contributing Factors***

- 1) Master's responsibilities
- 2) Energy consumed by the task
- 3) Duration of task
- 4) Time of day
- 5) Sleep environment
- 6) Work-hour rule

## Towing Survey

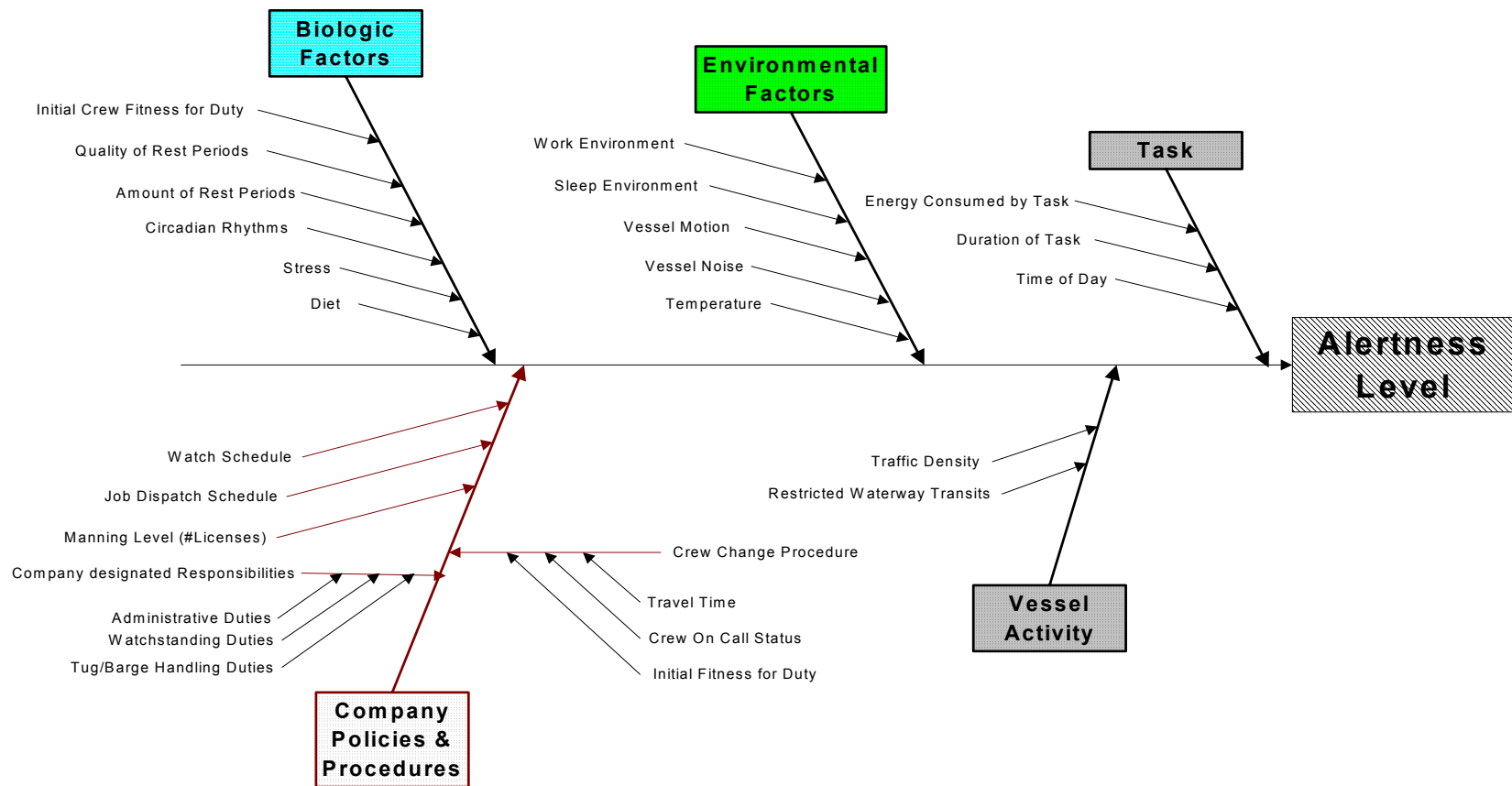
### HARBOR/INLAND TOWING OPERATIONS

#### Most Frequently Cited Factors Summary

	24 Hr/Day Ops		Dayboat Ops		River Operations	
	ALERT	WORK-HOUR	ALERT	WORK-HOUR	ALERT	WORK-HOUR
<b>Factors</b>						
Master's Responsibilities	•	•	•	•	•	•
Sleep Environment	•	•	•	•	•	•
Work Environment	•	•	•	•		
Ability to receive off-watch rest	•	•	•		•	
Duration of Task	•	•			•	•
6 & 6 Watch	•	•			•	•
Energy Consumed by Task			•	•	•	•
Time of Day			•	•	•	•
Job Dispatch Schedule	•	•	•			
Travel Time		•	•	•		
Initial Fitness for Duty	•		•	•		
Heavy Traffic		•		•	•	
Restricted Waterways		•		•	•	
Normal Watch Duties				•	•	•
On Call Status			•	•		
Making/Breaking Tows					•	
Work-Hour Restrictions						•

## HARBOR/INLAND TOWING

### SUMMARY OF ALL FACTORS IMPACTING CREW ALERTNESS



## **Ship Assist/Escort Towing Operations:**

### **24-Hour/Continuous Operations**

#### ***Alertness Issues***

- 1) Initial crew fitness for duty
- 2) Ability to receive off-watch rest
- 3) Ship docking operations
- 4) Job dispatch schedule

*Note: Each received the same percentage score.*

#### ***Work-Hour Rule Issues***

- 1) Ship docking operations
- 2) Job dispatch schedule
- 3) 6-on/6-off watch schedule
- 4) Running light between

#### ***Contributing Factors***

- 1) Duration of task
- 2) Masters' responsibilities
- 3) Regulations (general)
- 4) Regulations (federal)
- 5) Energy consumed by task
- 7) Sleep environment
- 8) Work-hour rule

## **Day-Boat Operations**

### ***Alertness Issues***

- 1) Initial crew fitness for duty
- 2) Crew member on-call status
- 3) Ability to receive off-watch rest
- 4) Ship escort operations

### ***Work-Hour Rule Issues***

- 1) Job dispatch schedule
- 2) Initial fitness for duty
- 3) Crew member on-call status
- 4) Ship escort operations
- 5) Travel time required for crew changes
- 6) Ship docking operations

### ***Contributing Factors***

- 1) Duration of task
- 2) Master's responsibilities
- 3) Energy consumed by task
- 4) Time of day
- 5) Company policies

## Towing Survey

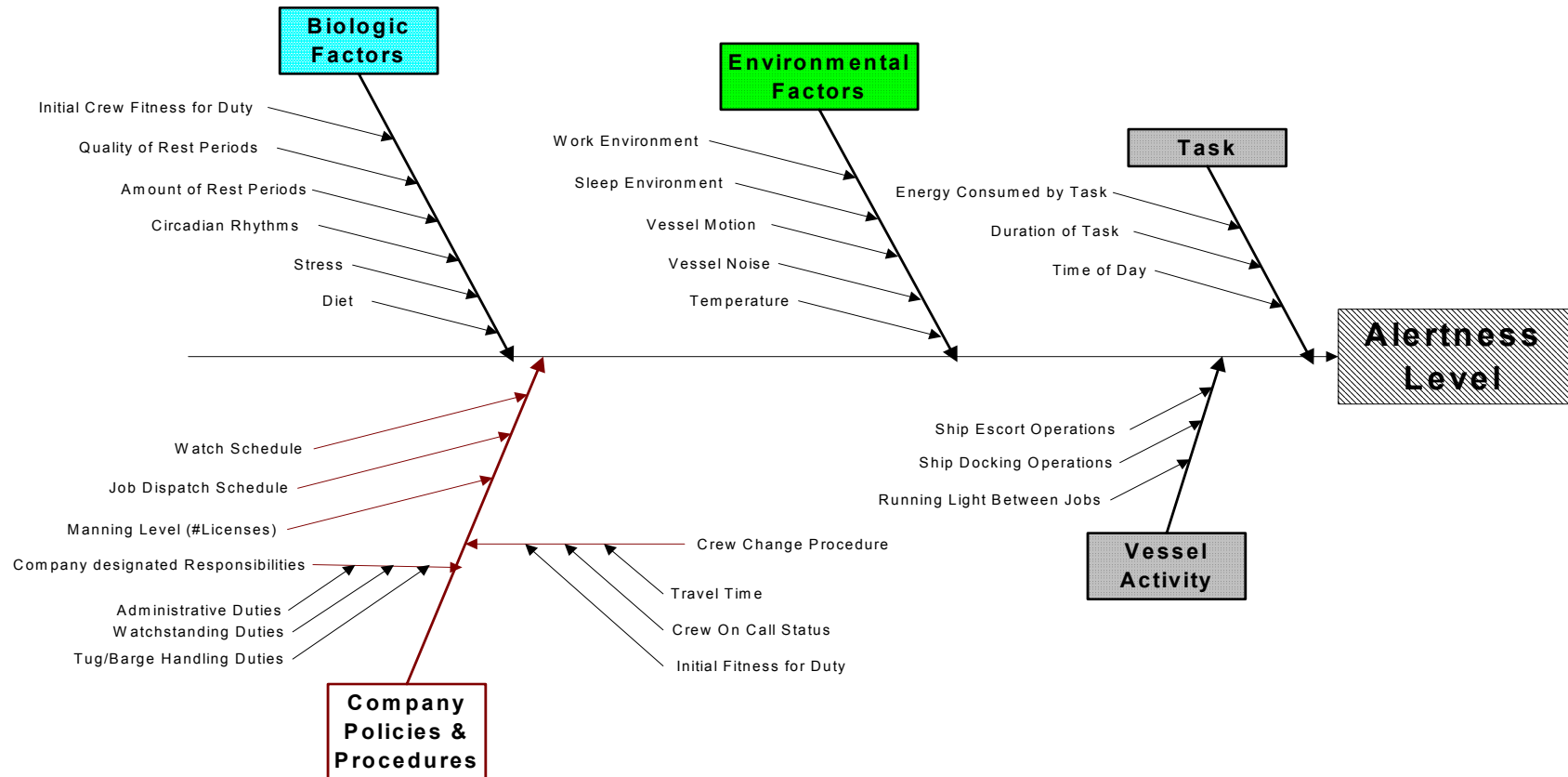
### SHIP ASSIST/ESCORT TOWING OPERATIONS

#### Most Frequently Cited Factors Summary

	24 Hr/Day Ops		Dayboat Ops	
	ALERT	WORK-HOUR	ALERT	WORK-HOUR
<b>Factors</b>				
Master's Responsibilities	•	•	•	•
Duration of Task	•	•	•	•
Energy Consumed by Task	•	•	•	•
Job Dispatch Schedule	•	•		•
Ship Docking Operations	•	•		•
Initial Fitness for Duty	•		•	•
Sleep Environment	•	•		
Regulations (General)	•	•		
Regulations (Federal)	•	•		
Ability to receive off-watch rest	•		•	
On Call Status			•	•
Ship Escort Operations			•	•
Company Policies			•	•
Travel Time				•
6 & 6 Watch		•		
Running Light Between Jobs		•		



## SHIP ASSIST/ESCORT TOWING SUMMARY OF ALL FACTORS IMPACTING CREW ALERTNESS



## 4.7 **Best-practices**

The collected best-practices fell into four (4) categories.

- 1) *3<sup>rd</sup> Licensed Crewman*
- 2) *Alternative or Flexible Watch Schedules*
- 3) *Personnel Management*
- 4) *Equipment*

### **3<sup>RD</sup> LICENSED CREWMAN**

#### **PRACTICE:**

Seven (7) described policies or procedures that ensured a 3<sup>rd</sup> licensed crewman would be part of the tug's crew complement. This was accomplished by:

- 1) Adding an additional licensed position (2<sup>nd</sup> Mate), or
- 2) Converting an existing unlicensed position (deckhand) to a licensed position.

#### **HISTORY:**

85% of 3<sup>rd</sup> License Best-practices were developed in response to a specific Crew Alertness/ Work-Hour compliance issue.

#### **RATIONALE:**

The extra license offered masters the flexibility to either augment an existing 6-on/6-off watchstanding system as necessary or implement a complete alternative watch system.

#### **UTILIZATION:**

3<sup>rd</sup> License best-practices were employed primarily in Ocean Towing operations (100%) and in Harbor/Ship Assist operations (14%).

#### **FORMAT:**

57% of these 3 License best-practices took the form of a written company policy. In the others it was an unwritten practice.

#### **COMPLIANCE:**

Shore-side management and vessel masters were designated to monitor compliance.

## WATCH SCHEDULES

### **PRACTICE:**

Five (5) described policies or procedures for implementing alternative watch schedules. Some of these outlined a completely new watch schedule such as a 7/7/5/5 while others described procedures to augment an existing watch schedule. These procedures included:

- 1) *Shorter watches after immediately departing a port.*
- 2) *Delaying a port departure to ensure adequate rest.*
- 3) *Allowing local harbor crews to go home for uninterrupted rest periods.*

### **HISTORY:**

100% of these best-practices were developed in response to specific Crew Alertness/ Work-Hour compliance issues.

### **RATIONALE:**

- 1) Alternative watch schedules allow crews to attain rest periods that are more in line with the most recent crew endurance research which outlines the need for a minimum of at least one off watch period of 7 or more hours.
- 2) Altering existing watch or vessel schedules enables crewman to accommodate the extra physical and mental demands placed on them during port operations, port entries and heavy weather while offshore.

### **UTILIZATION:**

Alternative Watch best-practices were utilized in Ocean/Near Coastal, Harbor and Ship Assist operations.

### **FORMAT:**

80% of these best-practices were unwritten practices.

### **COMPLIANCE:**

Shore-side management and vessel masters were designated to monitor compliance.

## PERSONNEL MANAGEMENT

### **PRACTICE:**

27 described Personnel Management policies or procedures that promoted crew alertness and work-hour compliance. These types of best-practices fell into 3 categories:

- 1) *Manning*
- 2) *Crew Scheduling*
- 3) *Crew Awareness*

### **RATIONALE:**

*Manning*-many policies and procedures were designed to provide redundancy of personnel for essential crew positions. Some examples of this are:

- Placing 2 captains on one vessel.
- Adding extra licensed personnel.
- Cross-training mates to assume some masters duties.

### **RATIONALE:**

*Crew Scheduling*-maintaining a match between a vessels workload and her crew's available work-hours. Examples of this type are:

- Temporarily taking a vessel offline to allow crew members an adequate rest period.
- Allowing crewmembers "on watch" to rest if the vessel is secured at a berth or dock.
- Switching out complete crews every 12 hours.

### **RATIONALE:**

*Crew Awareness*-developing practices that emphasize the value of proper rest, exercise, and nutrition encourage self-monitoring of work-hours. Examples of these types of best-practices are:

- Monthly safety meetings dedicated to crew alertness.
- Providing exercise & nutrition guidelines.
- Emphasize compliance with the 12-hour rule is a condition of employment.
- Employing the 12-hour rule the day before being called out for work.

### **HISTORY:**

85% of these best-practices were developed in response to specific Crew Alertness/ Work-Hour compliance issues.

## PERSONNEL MANAGEMENT (Cont'd)

### **UTILIZATION:**

Personnel Management best-practices were utilized in Ocean/Near Coastal, Harbor and Ship Assist operations.

### **FORMAT:**

52% of these best-practices were written practices.

### **COMPLIANCE:**

Shore-side management, vessel masters and crewmembers were designated to monitor compliance.

## EQUIPMENT

### **PRACTICE:**

Three (3) described Equipment employed to promote crew alertness:

- 1) *Locate berthing away from machinery rooms and towards vessels center.*
- 2) *Utilize pagers, e-mail or cell phones to communicate with crewmembers.*
- 3) *Install watch alarms*

### **RATIONALE:**

*Berthing:* locate berthing to minimize sleep interruption from vessel motion, angle and noise.

### **RATIONALE:**

*Pagers etc.:* utilize communication technology to eliminate the need for a continuous radio watch while berthed.

### **RATIONALE:**

*Watch Alarms:* utilize mechanical/electronic means to warn watchstander and vessel personnel when the watchstander falls below a minimum alertness threshold.

## **Recommendations**

## 5. Recommendations

### 5.1 Overview

The Quality Action Team was chartered to develop and recommend best-practices for both enhancing crew alertness and complying with existing federal regulations and company policies governing work-hours. Crew alertness and work-hour rule compliance are two separate issues. However, they share the following common goal:

**Create a level of crew alertness that consistently enables towing vessel operators to discharge their assigned duties safely and efficiently, thereby minimizing the risk to vessel personnel, the public and the environment.**

The Quality Action Team has elected to describe its recommendations within two distinct time frames.

### 5.2 Long Term Recommendations

#### 5.2.1 Crew Endurance Management Systems (CEMS)

The QAT recommends that the American Waterways Operators in conjunction with the USCG develop a Crew Endurance Management System applicable to the towing industry based on the guidance included in the U.S. Coast Guard publication “Management of Endurance Risk Factors: A Guide for Deep Draft Vessels”. This publication indicates that an additional guide, specific to towing operations, will be available in the future. These publications should be two of the resources used by towing companies in developing a CEMS appropriate for the West Coast towing industry.

#### 5.2.2 Safety Management System Crew Alertness Component

The QAT further recommends that the American Waterways Operators (AWO) incorporate the principles of the developed Crew Endurance Management System into the required elements of the Responsible Carrier Program. CEMS policies and procedures should be fully incorporated into companies’ safety management systems, and, where companies are Responsible Carrier Program (RCP) compliant, into their RCP policies and procedures.

### **5.3 Interim Recommendations**

The following recommendations are interim measures to assist West Coast towing companies in managing crew alertness and work-hour rule compliance prior to the implementation of a Crew Endurance Management System. These interim measures will also function as a resource and may become components of a CEMS.

#### **5.3.1 12-hour Law Compliance Recommendations**

##### **5.3.1.1 Background**

In recent years crew alertness level has been identified as a contributing factor to several marine towing casualties in the Pacific Region. Some of these marine casualties presented serious threats to life and property.

The 12-hour law (also known as the 12-hour rule) represents a prescriptive regulatory approach to managing towing vessel crew alertness. Although many towing companies have procedures in place to ensure 12-hour rule compliance, the SR 520 Bridge Allision highlights a critical need for a more consistent application of practices that address 12-hour rule compliance. In response, a list of Best Management Practices (BMPs) was examined to facilitate and promote consistent compliance with the 12-hour rule throughout the West Coast towing industry.

##### **5.3.1.2 Development**

Representatives from West Coast towing companies, the United States Coast Guard and the Washington State Department of Ecology worked jointly under the umbrella of the Pacific Region Crew Alertness Quality Action Team to create this list of Best-Management Practices (BMPs).

##### **5.3.1.3 Applicability**

46 U.S.C. 8104(h) (12-hour Rule) applies to a towing vessel that is at least 26 feet in length measured from end to end over the deck (excluding sheer) and operated by an individual licensed to operate that type of vessel.

##### **5.3.1.4 Statutory Requirement**

46 U.S.C. 8104(h) (12-hour rule) states:

“On a vessel to which section 8904 of this title applies, an individual licensed to operate a towing vessel may not work for more than 12 hours in a consecutive 24-hour period except in an emergency”.



### **5.3.1.5 12-hour Law Best Management Practices**

Licensed mariners who operate towing vessels in the Pacific Region face the challenging task of meeting their vessels operational and safety demands while remaining within the 12-hour Rule framework. They are in a dynamic environment at sea, operating under a complex regulatory matrix, utilizing their allotted work-hours to address a constantly changing set of vessel, company and customer demands. Many of these demands are essential to the vessel's safe and efficient operation. However, the time frame for these tasks can be unpredictable and may fall outside a mariner's normal watchstanding hours.

Operational factors leading to non-compliance usually involve a licensed mariner being called to duty off-watch. He or she may already have expended all of his or her available work-hours during a normal watch schedule (such as 6-on/6-off) or, if there are off-watch work-hours available, the duration of the off-watch task may exceed the mariner's work-hour limit.

The Best Management Practices described in the following pages have been developed by West Coast towing companies in response to specific situations that consistently required licensed officers to perform tasks outside their normal watchstanding hours. This guideline is designed to assist towing vessel operators to identify specific towing operations that may be at risk of violating the 12-hour rule.

The information contained in this guideline is not intended to replace existing company policies, vessel procedures or federal law. This guideline identifies Best Management Practices (BMP) currently utilized by West Coast towing companies to address areas of potential non-compliance.

Towing vessel management, Masters and Mates are advised to view the listed Best Management Practices as a guide toward establishing, improving or validating policies or practices that promote more consistent and reliable compliance with the 12-hour rule. The QAT recommends the American Waterways Operators (AWO) incorporate the Best Management Practices contained herein into the required elements of the Responsible Carrier Program.

The compliance measures listed below are advisory in nature and do not lessen the responsibility of owners, operators and masters to comply with all applicable international, Federal and State regulations.

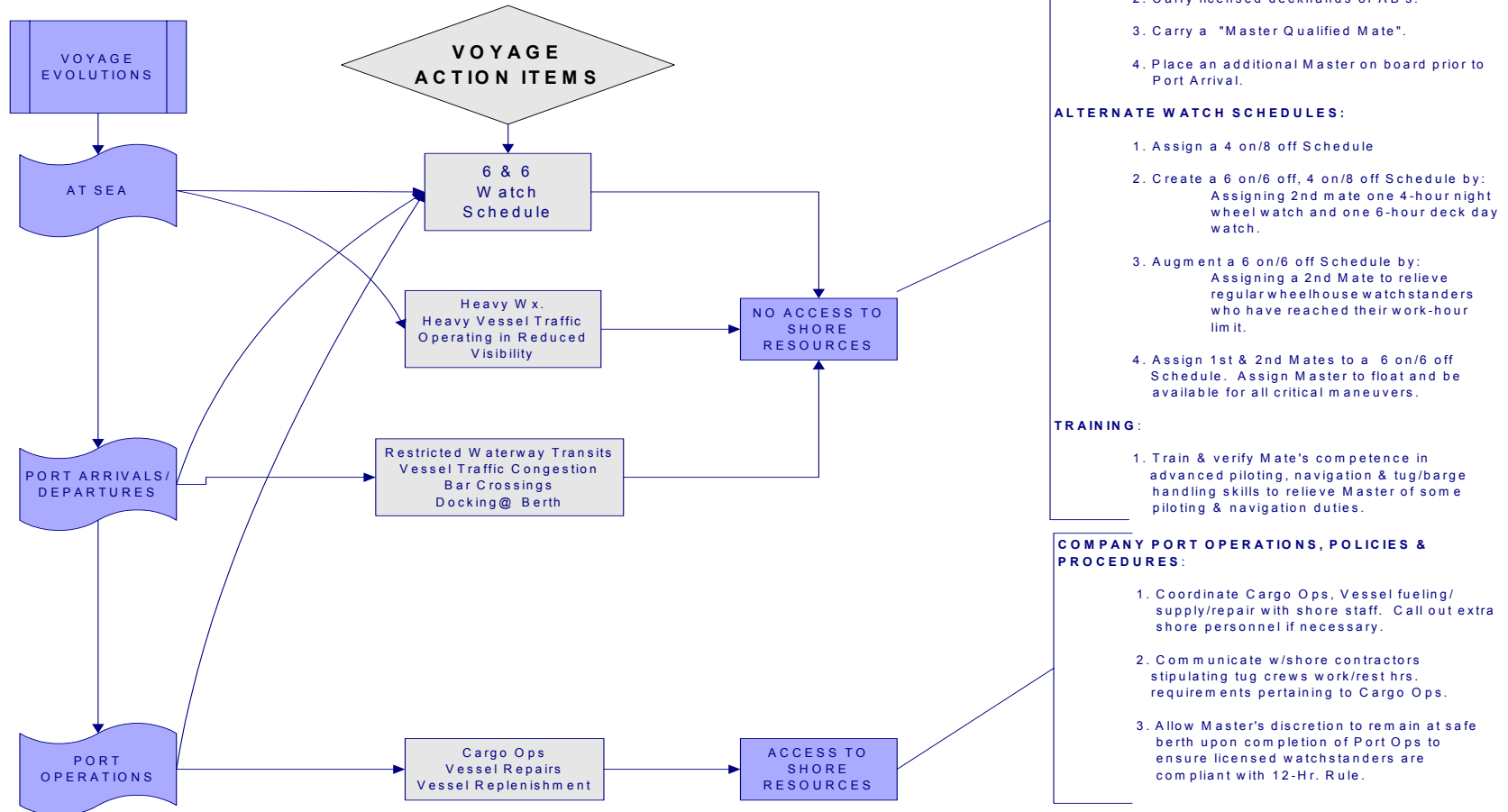
The collected BMPs have been divided into three (3) operational categories:

- 1) **Ocean & Near Coastal Towing**
- 2) **Harbor, River and Inland Towing**
- 3) **Ship Assist and Escort Towing**

Each towing category identifies voyage evolutions and specific situations in which the Best Management Practices may help to avoid non-compliance with the 12-hour law.

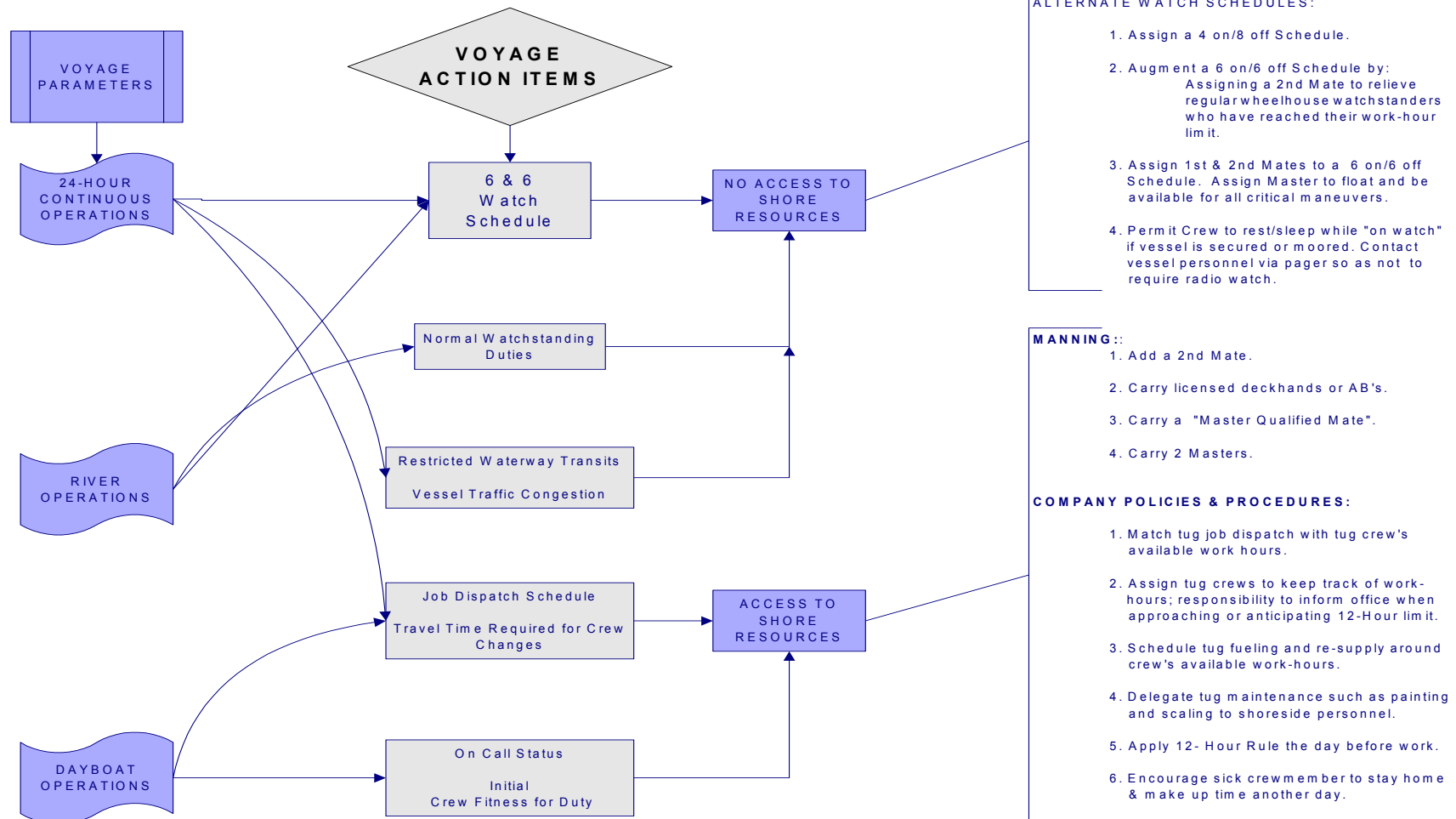
# 12- Hour Rule BMPS

OCEAN /NEAR COASTAL TOWING



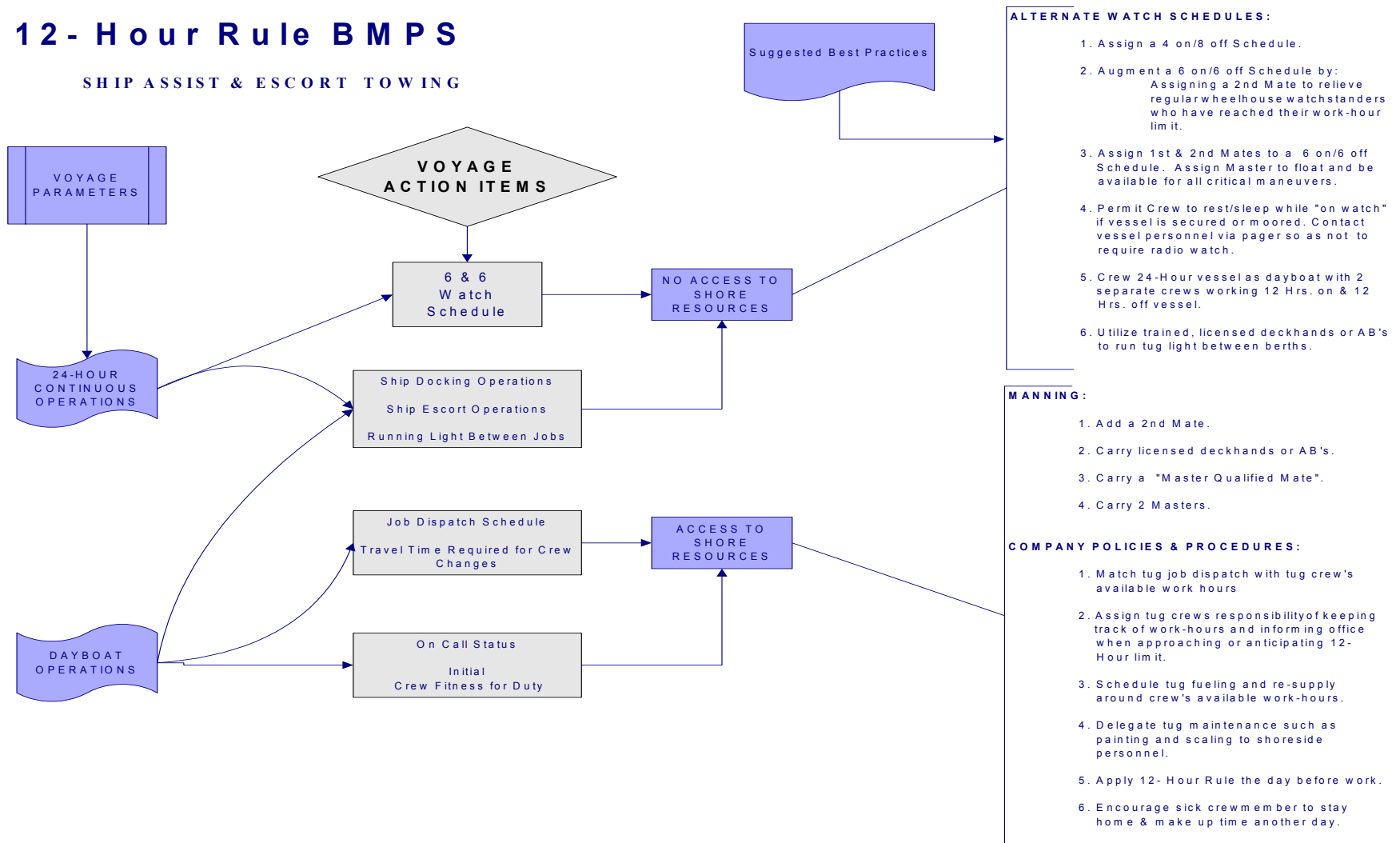
# 12- Hour Rule BMPS

## HARBOR/INLAND/RIVER TOWING



# 12- Hour Rule B M P S

## SHIP ASSIST & ESCORT TOWING



### **5.3.2 Crew Alertness Training**

The QAT recommends that towing companies immediately incorporate a module regarding crew endurance factors into their crew training program (basic & refresher training). Such training should include information regarding the physiological and psychological impacts of fatigue, human sleep patterns and circadian patterns (biological clock), factors affecting sleep quality, and other factors such as ergonomics that have the potential to reduce crew endurance and/or performance. The training should also clearly describe a company's policies and procedures for reporting and addressing reduced crew alertness (fatigue) when it is identified.

### **5.3.3 Implementation**

- 1) The Quality Action Team recommends distribution of this report to the West Coast towing industry.
- 2) The implementation of these recommended best practices among American Waterways Operators companies' participants should be added as a component to the current Responsible Carrier Program (RCP) audit procedure.
- 3) The implementation of these best practices among non-American Waterways Operators companies will best be pursued by the Coast Guard through contacts in Harbor Safety Committees and other industry forums.
- 4) Companies not implementing the best practices contained within the recommendation section of this report, or equivalent, should be advised that they do not meet industry standards. Captains of the Port are encouraged to meet with representatives of these companies to determine what, if any steps are being taken to ensure maintenance of crew endurance and compliance with the 12-hour rule.

# **Appendices**

## Appendix A

### Towing Industry Manning and Work-hour Regulations

#### 46USC8904 Towing Vessels

- (a) A Towing vessel that is at least 26 feet in length measured from end to end over the deck (excluding sheer), shall be operated by an individual licensed by the Secretary to operate that type of vessel in the particular geographic area, under prescribed conditions.

#### 46USC 8301 Minimum number of licensed individuals

- (a) Except as provided in chapter 89 of this title and except for a vessel operating only on rivers, harbors, lakes (except the Great Lakes), bays, sounds, bayous, and canals, a vessel subject to inspection under chapter 33 of this title shall engage a minimum of licensed individuals as follows:
  - (1) Each of those vessels propelled by machinery or carrying passengers shall have a licensed master.
  - (3) A vessel of at least 200 gross tons but less than 1,000 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title and propelled by machinery shall have 2 licensed mates.
  - (4) A vessel of at least 100 gross tons but less than 200 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title and propelled by machinery shall have one licensed mate. However, if the vessel is on a voyage of more than 24 hours, it shall have 2 licensed mates.

#### 46USC8104 Watches

- (a) An owner, charterer, managing operator, master, individual in charge, or other person having authority may permit an officer to take charge of the deck watch on a vessel when leaving or immediately after leaving port only if the officer has been off duty for at least 6 hours within the 12 hours immediately before the time of leaving.
- (b) On an oceangoing or coastwise vessel of not more than 100 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title (except a fishing, fish processing, or fish tender vessel), a licensed individual may not be required to work more than 9 of 24 hours when in port, including the date of arrival, or more than 12 of 24 hours at sea, except in an emergency when life or property are endangered.
- (d) On a merchant vessel of more than 100 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title (except a vessel only operating on rivers, harbors, lakes (except the Great Lakes), bays, sounds, bayous, and canals, a fishing, fish tender, or whaling vessel, a fish processing vessel of not more than 5,000 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title, yacht, or vessel engaged in salvage operations), the licensed individuals, sailors, coal passers, firemen, oilers, and water tenders shall be divided, when at sea, into at least 3 watches, and shall be kept on duty successively to perform ordinary work incident to

## Appendices

the operation and management of the vessel. The requirement of this subsection applies to radio officers only when at least 3 radio officers are employed. A licensed individual or seaman in the deck or engine department may not be required to work more than 8 hours in one day.

- (e) On a vessel designated by subsection (d) of this section -
  - (1) A seaman may not be -
    - (A) engaged to work alternately in the deck and engine departments; or
    - (B) required to work in the engine department if engaged for deck department duty or required to work in the deck department if engaged for engine department duty;
  - (2) A seaman may not be required to do unnecessary work on Sundays, New Year's Day, July 4<sup>th</sup>, Labor Day, Thanksgiving Day, or Christmas Day, when the vessel is in a safe harbor, but this clause does not prevent dispatch of a vessel on a voyage; and
  - (3) When the vessel is in a safe harbor, 8 hours (including anchor watch) is a day's work.
- (f) Subsections (d) and (e) of this section do not limit the authority of the master or other officer or the obedience of the seamen when, in the judgment of the master or other officer, any part of the crew is needed for -
  - (1) maneuvering, shifting the berth of, mooring, or unmooring, the vessel;
  - (2) performing work necessary for the safety of the vessel, or the vessel's passengers, crew, or cargo;
  - (3) saving life on board another vessel in jeopardy; or
  - (4) performing fire, lifeboat, or other drills in port or at sea.
- (g) On a towing vessel, an offshore supply vessel, or a barge to which this section applies, that is engaged on a voyage of less than 600 miles, the licensed individuals and crewmembers (except the coal passers, firemen, oilers, and water tenders) may be divided, when at sea, into at least 2 watches.
- (h) On a vessel to which section 8904 of this title applies, an individual licensed to operate a towing vessel may not work for more than 12 hours in a consecutive 24-hour period except in an emergency.

### 46US8701. Merchant mariners' documents required

- (a) This section applies to a merchant vessel of at least 100 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title except -
- (b) A person may not engage or employ an individual, and an individual may not serve, on board a vessel to which this section applies if the individual does not have a merchant mariner's document issued to the individual under section 7302 of this title. Except for an individual required to be licensed or registered under this part, the document must authorize service in the capacity for which the holder of the document is engaged or employed.

### 46US8702. Certain crew requirements

- (a) This section applies to a vessel of at least 100 gross tons as measured under section 14502 of this title, or an alternate tonnage measured under section 14302 of this title as prescribed by the Secretary under section 14104 of this title except -
- (b) A vessel may operate only if at least -
  - (1) 75 percent of the crew in each department on board is able to understand any order spoken by the officers, and
  - (2) 65 percent of the deck crew (excluding licensed individuals) have merchant mariners' documents endorsed for a rating of at least able seaman, except that this percentage may be reduced to 50 percent -



## Appendices

- (i) on a vessel permitted under section 8104 of this title to maintain a 2-watch system; or
- (ii) on a fish tender vessel engaged in the Aleutian trade.
- (c) An able seaman is not required on a towing vessel operating on bays and sounds connected directly with the seas.
- (d) An individual having a rating of less than able seaman may not be permitted at the wheel in ports, harbors, and other waters subject to congested vessel traffic, or under conditions of reduced visibility, adverse weather, or other hazardous circumstances.

### Sec. 15.301 Definitions of terms used in this part.

- (a) The following terms defined in this subpart apply only to the manning of vessels subject to the manning provisions in the navigation and shipping laws of the United States:

*Assistance Towing* means towing a disabled vessel for consideration.

*Coastwise seagoing vessel* means a vessel that is authorized by its Certificate of Inspection to proceed beyond the Boundary Line established in part 7 of this chapter.

*Deck crew* (excluding licensed individuals) means, as used in 46 U.S.C. 8702, only the following members of the deck department below the grade of licensed individual: Able seamen and ordinary seamen.

*Designated areas* means those areas within pilotage waters for which first class pilot's licenses or endorsements are issued under part 10, subpart G, of this Chapter, by the Officer in Charge, Marine Inspection (OCMI). The areas for which first class pilot's licenses or endorsements are issued within a particular Marine Inspection Zone and the specific requirements to obtain them may be obtained from the OCMI concerned.

*Directly supervised* means being in the direct line of sight of the person in charge or maintaining direct, two-way communications by a convenient, reliable means, such as a predetermined working frequency over a hand-held radio.

*Disabled vessel* means a vessel that needs assistance, whether docked, moored, anchored, aground, adrift, or under way; but does not mean a barge or any other vessel not regularly operated under its own power.

*Officer in Charge, Marine Inspection* (OCMI) for the purposes of part 15 means any person designated as such by the Commandant and who under the Coast Guard District Commander is in charge of an inspection zone.

*Pilotage waters* means the navigable waters of the United States, including all inland waters and offshore waters to a distance of three nautical miles from the baseline from which the Territorial Sea is measured.

*Staff officer* means a person who holds a certificate of registry in the staff department such as a purser, a medical doctor or professional nurse, which is issued by the Coast Guard.

*Self-Propelled* has the same meaning as the terms propelled by machinery and mechanically propelled. This term would also include vessels fitted with both sails and mechanical propulsion.

*Tank barge* means a non-self-propelled tank vessel.

*Tank vessel* means a vessel that is constructed or adapted to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue.

*Tankship* means any tank vessel constructed or adapted primarily to carry oil or hazardous material in bulk as cargo or cargo residue and propelled by power or sail.

*Transfer* means any movement of dangerous liquid or liquefied gas as cargo in bulk or as cargo residue to, from, or within a vessel by means of pumping, gravitation, or displacement. Section 13.127 of this chapter describes what qualifies as participation in a creditable transfer.

- (b) The following categories of licensed individuals are established in part 10 of this chapter. When used in this part, the following terms mean an individual holding a valid license and/or endorsement to serve in that capacity issued under part 10 of this chapter.

- (1) Master;
- (2) Mate;
- (3) Pilot;
- (4) Engineer;
- (5) Radio officer;
- (6) Operator of uninspected passenger vessels;
- (7) Offshore installation manager (OIM);

## Appendices

- (8) Barge supervisor (BS);
  - (9) Ballast control operator (BCO); and
  - (10) Reserved
  - (11) GMDSS radio operator.
- (c) The following ratings are established in part 12 of this chapter. When used in this part, terms for the ratings identify persons holding valid merchant mariners' documents for service in the ratings issued under that part:
- (1) Able seaman.
  - (2) Ordinary seaman.
  - (3) Qualified member of the engine department.
  - (4) Lifeboatman.
  - (5) Wiper.
  - (6) Steward's department (F.H.).
  - (7) GMDSS At-sea Maintainer.

### Sec. 15.610 Master and mate (pilot) of towing vessels.

Every towing vessel at least 8 meters (at least 26 feet) in length measured from end to end over the deck (excluding sheer), except a vessel described by the next sentence, must be under the direction and control of a person licensed as master or mate (pilot) of towing vessels or as master or mate of vessels of appropriate gross tonnage holding an endorsement on his or her license for towing vessels. This does not apply to any vessel engaged in assistance towing, or to any towing vessel of less than 200 gross tons engaged in the offshore mineral and oil industry if the vessel has sites or equipment of that industry as its place of departure or ultimate destination.

### Sec. 15.701 Officers Competency Certificates Convention, 1936.

- (a) This section implements the Officers Competency Certificates Convention, 1936, and applies to each vessel documented under the laws of the United States navigating seaward of the Boundary Lines in part 7 of this chapter, except: (1) A public vessel;
- (2) A wooden vessel of primitive build, such as a dhow or junk;
- (3) A barge; and,
- (4) A vessel of less than 200 gross tons.
- (b) The master, mates and engineers on any vessel to which this section applies must hold a license to serve in that capacity issued by the Coast Guard under part 10 of this chapter.
- (c) A vessel to which this section applies, or a foreign flag vessel to which the Convention applies, may be detained by a designated official until that official is satisfied that the vessel is in compliance with the Convention. Designated official includes Coast Guard officers, Coast Guard petty officers and officers or employees of the Customs Service.
- (d) Whenever a vessel is detained, the owner, charterer, managing operator, agent, master, or individual in charge may appeal the detention within five days under the provisions of Sec. 2.01-70 of this chapter.

### *Sec. 15.705 Watches.*

- (a) Title 46 U.S.C. 8104 is the law applicable to the establishment of watches aboard certain U.S. vessels. The establishment of adequate watches is the responsibility of the vessel's master. The Coast Guard interprets the term watch to be the direct performance of vessel operations, whether deck or engine, where such operations would routinely be controlled and performed in a scheduled and fixed rotation. The performance of maintenance or work necessary to the vessel's safe operation on a daily basis does not in itself constitute the establishment of a watch. The minimal safe manning levels specified in a vessel's certificate of inspection takes into consideration routine maintenance requirements and ability of the crew to perform all operational evolutions, including emergencies, as well as those functions which may be assigned to persons in watches.
- (b) Subject to exceptions, 46 U.S.C. 8104 requires that when a master of a seagoing vessel of more than 100 gross tons establishes watches for the licensed individuals, sailors, coal passers, firemen, oilers and watertenders, the personnel shall be divided, when at sea, into at least three watches and

## Appendices

shall be kept on duty successively to perform ordinary work incident to the operation and management of the vessel. The Coast Guard interprets sailors to mean those members of the deck department other than licensed officers, whose duties involve the mechanics of conducting the ship on its voyage, such as helmsman (wheelsman), lookout, etc., and which are necessary to the maintenance of a continuous watch. Sailors is not interpreted to include able seamen and ordinary seamen not performing these duties.

- (c) Subject to exceptions, 46 U.S.C. 8104(g) permits the licensed individuals and crew members (except the coal passers, firemen, oilers, and watertenders) to be divided into two watches when at sea and engaged on a voyage of less than 600 miles on the following categories of vessels:
  - (1) Towing vessel;
  - (2) Offshore supply vessel; or,
  - (3) Barge.
- (d) Subject to exceptions, 46 U.S.C. 8104(h) permits a licensed master or mate (pilot) operating a towing vessel that is at least 26 feet in length measured from end to end over the deck (excluding sheer) to work not more than 12 hours in a consecutive 24 hour period except in an emergency. The Coast Guard interprets this, in conjunction with other provisions of the law, to permit licensed masters or mates (pilots) serving as operators of towing vessels that are not subject to the provisions of the Officers' Competency Certificates Convention, 1936, to be divided into two watches regardless of the length of the voyage.

### Sec. 15.710 Working hours.

In addition to prescribing watch requirements, 46 U.S.C. 8104 sets limitations on the working hours of licensed individuals and crewmembers, prescribes certain rest periods, and prohibits unnecessary work on Sundays and certain holidays when the vessel is in a safe harbor. It is the responsibility of the master or person in charge to ensure that these limitations are met. However, under 46 U.S.C. 8104(f), the master or other licensed individual can require any part of the crew to work when, in his or her judgment, they are needed for:

- (a) Maneuvering, shifting berth, mooring, unmooring;
- (b) Performing work necessary for the safety of the vessel, or the vessel's passengers, crew, or cargo;
- (c) Saving of life on board another vessel in jeopardy; or,
- (d) Performing fire, lifeboat, or other drills in port or at sea.

### Sec. 15.805 Master

- (a) There must be an individual holding an appropriate license as master in command of each of the following vessels:
  - (1) Every self-propelled, seagoing documented vessel of 200 gross tons and over.
  - (2) Every self-propelled inspected vessel.
  - (3) Every inspected passenger vessel.
  - (4) Every inspected small passenger vessel.
  - (5) Every towing vessel of at least 8 meters (at least 26 feet) or more in length.
- (b) Every vessel documented under the laws of the United States, other than a vessel with only a recreational endorsement, must be under the command of a U.S. citizen.

### Sec. 15.910 Towing vessels.

*No person may serve as master or mate (pilot) of any towing vessel of at least 8 meters (at least 26 feet) in length unless he or she holds a license authorizing such service.*

## **Appendix B**

[MOC pol ltr 4-00 rev 1.pdf](#)

## **Appendix C**

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## Appendices